Amendments to the Claims

1. (Original)

An invert arm assembly for use in an individual section glassware forming machine, which includes:

an invert base that is oscillatable about an axis between first and second angularly-spaced positions,

a ball screw positioned within said invert base coaxially with said axis, said ball screw having spaced oppositely threaded portions,

first and second nuts each threadably engaging a separate one of said oppositely threaded portions of said ball screw, said nuts being reciprocatable toward and away from each other along said ball screw upon rotation of said ball screw,

first and second neck ring arms, respectively engaging said first and second nuts, said first and second neck ring arms being reciprocatable toward and away from each other along said axis with said first and second nuts,

a first reversible electric motor operably associated with said invert base to rotate said invert base about said axis in a pair of opposed directions, and

a second reversible electric motor operably associated with said ball screw to rotate said ball screw in opposed directions and move said nuts and said neck ring arms toward and away from each other along said axis.

2. (Original)

The invert arm assembly of claim 1 wherein the invert base includes a ball spline shaft carried for rotation about said axis and having at least one groove formed

therein, at least one set of balls associated with at least one groove, and a pair of ball spline nuts operably associated with the ball spline shaft through the balls so that the ball spline nuts rotate with the ball spline shaft in both directions of rotation of the ball spline shaft.

3. (Original)

The invert arm assembly of claim 2 wherein each ball spline nut includes at least one groove for receipt of at least a portion of said balls so that each ball spline nut is coupled to the ball spline shaft for co-rotation of the ball spline nuts and ball spline shaft.

4. (Original)

The invert arm assembly of claim 2 wherein the ball spline nuts are carried for slidable reciprocation on the ball spline shaft.

5. (Original)

The invert arm assembly of claim 2 wherein each ball spline nut includes a neck ring paddle on which a separate neck ring arm is carried so that the neck ring arms are inverted and reverted about said axis as the ball spline shaft is rotated in said one direction and said other direction.

6. (Original)

The invert arm assembly of claim 5 wherein each neck ring paddle is integrally formed with a ball spline nut.

7. (Original)

The invert arm assembly of claim 2 wherein said first and second nuts are each operably associated with a separate one of the ball spline nuts so that the ball spline nuts slidably reciprocate along said ball spline shaft as the first and second nuts reciprocate along said ball screw in response to rotation of the ball screw.

8. (Original)

The invert arm assembly of claim 7 which also comprises at least one clutch pin for each of the first and second nuts, each clutch pin operably associated with one of the first and second nuts and its associated ball spline nut to operably connect them together so that the first nut and its associated ball spline nut co-reciprocate and the second nut and its associated ball spline nut co-reciprocate.

9. (Original)

The invert arm assembly of claim 8 wherein the ball spline shaft has a plurality of slots formed therein with each slot adapted to receive a clutch pin and permit slidable reciprocation of the clutch pin in said slot relative to the ball spline shaft.

10. (Original)

The invert arm assembly of claim 1 wherein the ball screw rotates relative to the first and second nuts, and the first and second nuts move axially along the ball screw.

11. (Original)

The invert arm assembly of claim 1 wherein each of the first and second nuts includes an extension, the extension of each nut being connected to the nut and also being fixed against rotation so that the nut is not rotated by the ball screw.

12. (Original)

The invert arm assembly of claim 11 which also comprises a housing and a pair of spaced torque tubes connected to the housing so that the torque tubes cannot rotate, each of the first and second nuts being slidably received at least in part in a respective one of the torque tubes, each torque tube being connected to its respective one of the first and second nuts to prevent relative rotation between the torque tube and nut.

13. (Original)

The invert arm assembly of claim 12 wherein one of the extensions and the torque tubes includes at least one key and the other of the extensions and the torque tubes includes at least one key way, with each keyway adapted to slidably receive a key.

14. (Original)

The invert arm assembly of claim 11 wherein each of the first and second nuts also includes a bearing sleeve that is reciprocated axially with its associated nut and is rotatably coupled to its associated nut so that each bearing sleeve is capable of rotation relative to its associated nut.

15. (Original)

The invert arm assembly of claim 14 which also comprises at least one clutch pin for each of the first and second nuts, each clutch pin operably associated with one of the bearing sleeves and an associated ball spline nut to operably connect them together so that the first nut and its associated ball spline nut co-reciprocate and the second nut and its associated ball spline nut co-reciprocate, and wherein rotation of the ball spline nuts causes rotation of the bearing sleeves without rotation of the first and second nuts.

16. (Original)

The invert arm assembly of claim 15 wherein each bearing sleeve carries at least one clutch pin and each ball spline nut has at least one opening to receive a clutch pin.

17. (Original)

The invert arm assembly of claim 15 wherein the ball spline shaft has a separate slot for each clutch pin, each slot extending along the axis so that an associated clutch pin can move along the axis relative to the ball spline shaft.

18. (Original)

The invert arm assembly of claim 1 wherein the second electric motor is connected to the ball screw by a plurality of gears including a drive gear driven for rotation by the second electric motor, a driven gear operably connected to the ball screw to rotate the ball screw, and an idler gear that transmits rotation from the drive gear to the driven gear.

19. (Original)

The invert arm assembly of claim 18 which also includes a second idler gear connected to the other idler gear by a suspension mechanism that permits relative movement of the idler gears while maintaining meshed engagement of both idler gears with the drive gear and the driven gear.

20. (Original)

The invert arm assembly of claim 19 wherein the second idler gear is disposed on one side of a line connecting an axis of rotation of the drive gear and an axis of rotation of the driven gear, and the other idler gear is on the other side of the line so that

in one direction of rotation of the drive gear, the other idler gear transmits the rotational force to the driven gear, and in the other direction of rotation of the drive gear the second idler gear transmits the rotational force to the driven gear.

21. (Original)

The invert arm assembly of claim 19 wherein the idler gears are yieldably biased towards each other.

22. (Original)

The invert arm assembly of claim 19 wherein the suspension device includes a spring that yieldably biases the idler gears towards each other.

23. (Original)

The invert arm assembly of claim 2 which also includes a plurality of gears through which the first electric motor drives the ball spline shaft for rotation to invert and revert the invert base, the plurality of gears including a drive gear driven for rotation by the first electric motor, a driven gear operably connected to the ball spline shaft to rotate the ball spline shaft, and an idler gear that transmits rotation from the drive gear to the driven gear.

24. (Original)

The invert arm assembly of claim 23 wherein the idler gear is adjustable to vary its position relative to the other gears.

25. (Original)

The invert arm assembly of claim 24 which also includes an eccentric on which the idler gear is mounted so that movement of the eccentric permits adjustment of the position of the idler gear.

26. (Original)

The invert arm assembly of claim 25 which also includes a shaft on which the idler gear is mounted and wherein the eccentric includes a bushing disposed between the shaft and the idler gear, the bushing having at least some eccentricity relative to the shaft.

27. (Original)

The invert arm assembly of claim 26 which also includes a fixed housing of the assembly and wherein the shaft is adjustably carried by the housing to permit adjustment of the position of the idler gear.

28. (Original)

The invert arm assembly of claim 27 which also includes an idler gear mounting shaft that includes a pair of opposed adjustment screws and the shaft on which

the idler gear is mounted which is movable relative to the mounting shaft and wherein the position of shaft on which the idler gear is mounted relative to said mounting shaft can be maintained by manipulation of said adjustment screws.

29. (Original)

The invert arm assembly of claim 1 which also includes a housing that provides a sealed enclosure for at least the invert base, the ball screw, and the first and second nuts to facilitate application of fluids to one or more of these components.

30. (Original)

The invert arm assembly of claim 29 wherein the housing includes a fluid inlet through which fluid enters the housing and a fluid outlet through which fluid may be removed from the housing.

31. (Original)

The invert arm assembly of claim 30 wherein the fluid inlet includes a fluid inlet connector and said fluid outlet includes a fluid outlet connector, with both the fluid inlet connector and fluid outlet connector being connectable with mating connectors generally simultaneously as the housing is put in place for operation of the invert arm assembly.

32. (Original)

The invert arm assembly of claim 31 which also includes an utility connector module carried by the housing that includes the fluid inlet connector, the fluid outlet connector, and at least one electrical connector for providing electricity to the first and second electric motors.

33. (Original)

The invert arm assembly of claim 32 wherein the fluid inlet connector, the fluid outlet connector and each of said at least one electrical connectors are slidably connectable with mating connectors generally simultaneously as the housing is put in place for operation of the invert arm assembly.

34. (Original)

The invert arm assembly of claim 32 wherein the first and second electric motors are of the servo controlled type and wherein the utility connector module includes at least one resolver electrical connector that is connectable with a mating connector to provide desired signals to a resolver of the electric motors.

35. (Original)

The invert arm assembly of claim 32 wherein both the first and second electric motors are connected to one electrical connector.

36. (Original)

The invert arm assembly of claim 34 wherein the resolvers of both the first and second electric motors are connected to one resolver electrical connector.

37. (Original)

The invert arm assembly of claim 33 wherein the fluid inlet connector, the fluid outlet connector and each of said at least one electrical connectors are of the quick connect blind mate type so that they are automatically slidably connected with their mating connectors when the housing is put in place.

38. (Original)

The invert arm assembly of claim 30 wherein the fluid outlet includes a drain valve that is normally closed to prevent fluid from leaving the housing when the housing is not in place for operation of the invert arm assembly and is opened when the housing is secured in place for operation of the invert arm assembly.

39. (Original)

The invert arm assembly of claim 30 wherein the fluid inlet includes a drain valve that is normally closed to prevent fluid from leaving the housing when the housing is not in place for operation of the invert arm assembly and is opened when the housing is secured in place for operation of the invert arm assembly.

40. (Original)

An utility connection assembly in a glassware forming machine having at least one electric motor and a circulating fluid, the utility connection assembly includes:

a housing in which the electric motor is received and a fluid passage is defined to receive and route fluid in the housing;

an electrical connector carried by the housing in electrical communication with the electric motor and adapted to be mated with another electrical connector in communication with an electrical supply;

a fluid connector carried by the housing in communication with the fluid passage and through which fluid enters the glassware forming machine, the fluid connector adapted to be mated to another fluid connector through which fluid from a fluid supply is provided;

said electrical connector and said fluid connector being automatically slidably mated with their respective connectors when the housing is in position for use of the glassware forming machine.

41. (Original)

The utility connection assembly of claim 40 wherein the electrical connector and fluid connector are of the blind mate type.

42. (Original)

The utility connection assembly of claim 40 which also includes a second fluid connector carried by the housing and through which fluid exits the housing.

43. (Original)

The utility connection assembly of claim 42 wherein the second fluid connector includes a drain valve that is normally closed to prevent fluid flow therethrough, and is opened upon placing the housing in position for use of the glassware forming machine.

44. (Original)

The utility connection assembly of claim 43 wherein the drain valve is yieldably biased to its closed position so that when the housing is not in place for use of the glassware forming machine the drain valve is closed.

45. (Original)

The utility connection assembly of claim 40 wherein the invert arm assembly includes a plurality of electric motors and the power to each electric motor is provided through one electrical connector.

46. (Original)

The utility connection assembly of claim 45 which also includes a second electrical connector carried by the housing and adapted to communicate with at least one electric motor and a mating connector, and wherein at least one electric motor is servo controlled and a resolver signal for said electric motor is communicated with the second electrical connector.

47. (Original)

The utility connection assembly of claim 40 wherein the housing includes locator pins that positively locate the housing relative to the mating connectors for the electrical connector and the fluid connector.

48. (Original)

The utility connection assembly of claim 40 wherein the electrical connector and fluid connector are carried adjacent to the bottom of the housing, and when the bottom of the housing is placed onto a support surface the electrical connector and fluid connector are mated with their respective mating connectors.

49. (Original)

An invert arm assembly for use in an individual section glassware forming machine, which includes:

an invert base that is oscillatable about an axis between first and second angularly-spaced positions and includes a ball spline shaft carried for rotation about said axis and having at least one groove formed therein, at least one set of balls associated with at least one groove, and a pair of ball spline nuts operably associated with the ball spline shaft through the balls so that the ball spline nuts rotate with the ball spline shaft in both directions of rotation of the ball spline shaft,

a ball screw positioned within said invert base coaxially with said axis, said ball screw having spaced oppositely threaded portions,

first and second nuts each threadably engaging a separate one of said oppositely threaded portions of said ball screw for reciprocation toward and away from each other along said ball screw upon rotation of said ball screw, each of said first and second nuts being fixed against rotation and operably associated with a separate one of the ball spline nuts so that the ball spline nuts slidably reciprocate along said ball spline shaft as the first and second nuts reciprocate along said ball screw, said ball spline nuts rotating about said axis relative to the first and second nuts,

first and second neck ring arms, respectively associated with said first and second nuts, said first and second neck ring arms being reciprocatable toward and away from each other along said axis with said first and second nuts,

a first reversible electric motor operably associated with said invert base to rotate said invert base about said axis in a pair of opposed directions, and

a second reversible electric motor operably associated with said ball screw to rotate said ball screw in opposed directions and move said first and second nuts and said neck ring arms toward and away from each other along said axis.

50. (Original)

The invert arm assembly of claim 49 wherein each ball spline nut includes at least one groove for receipt of at least a portion of said balls so that each ball spline nut is coupled to the ball spline shaft for co-rotation of the ball spline nuts and ball spline shaft.

51. (Original)

The invert arm assembly of claim 49 wherein a separate neck ring arm is carried by each ball spline nut so that the neck ring arms are inverted and reverted about said axis as the ball spline shaft is rotated in said one direction and said other direction.

52. (Original)

The invert arm assembly of claim 49 which also comprises at least one clutch pin for each of the first and second nuts, each clutch pin operably associated with one of the first and second nuts and its associated ball spline nut to operably connect them together so that the first nut and its associated ball spline nut co-reciprocate and the second nut and its associated ball spline nut co-reciprocate.

53. (Original)

The invert arm assembly of claim 52 wherein the ball spline shaft has a plurality of slots formed therein with each slot adapted to receive a clutch pin and permit slidable reciprocation of the clutch pin in said slot relative to the ball spline shaft.

54. (Original)

The invert arm assembly of claim 49 wherein the ball screw rotates relative to the first and second nuts, and the first and second nuts move axially along the ball screw.

55. (Original)

The invert arm assembly of claim 49 wherein each of the first and second nuts includes an extension, the extension of each nut being connected to the nut and also being fixed against rotation so that the nut is not rotated by the ball screw.

56. (Original)

The invert arm assembly of claim 55 which also comprises a housing and a pair of spaced torque tubes connected to the housing so that the torque tubes cannot rotate, each of the first and second nuts being slidably received at least in part in a respective one of the torque tubes, each torque tube being connected to its respective one of the first and second nuts to prevent relative rotation between the torque tube and nut.

57. (Original)

The invert arm assembly of claim 56 wherein one of the extensions and the torque tubes includes at least one key and the other of the extensions and the torque tubes includes at least one key way, with each keyway adapted to slidably receive a key.

58. (Original)

The invert arm assembly of claim 55 wherein each of the first and second nuts also includes a bearing sleeve that is reciprocated axially with its associated nut and is rotatably coupled to its associated nut so that each bearing sleeve is capable of rotation relative to its associated nut.

59. (Original)

The invert arm assembly of claim 58 which also comprises at least one clutch pin for each of the first and second nuts, each clutch pin operably associated with one of the bearing sleeves and an associated ball spline nut to operably connect them together so that the first nut and its associated ball spline nut co-reciprocate and the second nut and its associated ball spline nut co-reciprocate, and wherein rotation of the ball spline nuts causes rotation of the bearing sleeves without rotation of the first and second nuts.

60. (Original)

The invert arm assembly of claim 59 wherein each bearing sleeve carries at least one clutch pin and each ball spline nut has at least one opening to receive a clutch pin.

61. (Original)

The invert arm assembly of claim 59 wherein the ball spline shaft has a separate slot for each clutch pin, each slot extending along the axis so that an associated clutch pin can move along the axis relative to the ball spline shaft.

62. (Original)

The invert arm assembly of claim 49 which also includes a plurality of gears through which the first electric motor drives the ball spline shaft for rotation to invert and revert the invert base, the plurality of gears including a drive gear driven for rotation by the first electric motor, a driven gear operably connected to the ball spline shaft to rotate the ball spline shaft, and an idler gear that transmits rotation from the drive gear to the driven gear.

63. (Original)

The invert arm assembly of claim 62 wherein the idler gear is adjustable to vary its position relative to the other gears.

64. (Original)

The invert arm assembly of claim 63 which also includes an eccentric on which the idler gear is mounted so that movement of the eccentric permits adjustment of the position of the idler gear.

65. (Original)

The invert arm assembly of claim 64 which also includes a shaft on which the idler gear is mounted and wherein the eccentric includes a bushing disposed between the shaft and the idler gear, the bushing having at least some eccentricity relative to the shaft.

66. (Original)

The invert arm assembly of claim 65 which also includes a fixed housing of the assembly and wherein the shaft is adjustably carried by the housing to permit adjustment of the position of the idler gear.

67. (Original)

The invert arm assembly of claim 66 which also includes an idler gear mounting shaft that includes a pair of opposed adjustment screws and the shaft on which the idler gear is mounted which is movable relative to the mounting shaft and wherein the position of shaft on which the idler gear is mounted relative to said mounting shaft can be maintained by manipulation of said adjustment screws.

68. (Original)

The invert arm assembly of claim 49 which also includes a housing that provides a sealed enclosure for at least the ball spline shaft, the ball spline nuts, the ball screw, and the first and second nuts to facilitate application of fluids to one or more of these components.

69. (Original)

The invert arm assembly of claim 68 wherein the housing includes a fluid inlet through which fluid enters the housing and a fluid outlet through which fluid may be removed from the housing.

70. (Original)

The invert arm assembly of claim 69 wherein the fluid inlet includes a fluid inlet connector and said fluid outlet includes a fluid outlet connector, with both the fluid inlet connector and fluid outlet connector being connectable with mating connectors generally simultaneously as the housing is put in place for operation of the invert arm assembly.

71. (Original)

The invert arm assembly of claim 70 which also includes an utility connector module carried by the housing that includes the fluid inlet connector, the fluid outlet

connector, and at least one electrical connector for providing electricity to the first and second electric motors.

72. (Original)

The invert arm assembly of claim 71 wherein the fluid inlet connector, the fluid outlet connector and each of said at least one electrical connectors are slidably connectable with mating connectors generally simultaneously as the housing is put in place for operation of the invert arm assembly.

73. (Original)

The invert arm assembly of claim 71 wherein the first and second electric motors are of the servo controlled type and wherein the utility connector module includes at least one resolver electrical connector that is connectable with a mating connector to provide desired signals to a resolver of the electric motors.

74. (Original)

The invert arm assembly of claim 73 wherein the resolvers of both the first and second electric motors are connected to one resolver electrical connector.

75. (Original)

The invert arm assembly of claim 71 wherein the fluid inlet connector, the fluid outlet connector and each of said at least one electrical connectors are of the quick connect blind mate type so that they are automatically slidably connected with their mating connectors when the housing is put in place.

76. (Original)

The invert arm assembly of claim 70 wherein the fluid outlet includes a drain valve that is normally closed to prevent fluid from leaving the housing when the housing is not in place for operation of the invert arm assembly and is opened when the housing is secured in place for operation of the invert arm assembly.

77. (Original)

The invert arm assembly of claim 70 wherein the fluid inlet includes a drain valve that is normally closed to prevent fluid from leaving the housing when the housing is not in place for operation of the invert arm assembly and is opened when the housing is secured in place for operation of the invert arm assembly.

78. (New)

A glassware forming machine including a blank mold having at least one mold cavity for receipt of at least one glass gob, a forming device to form said at least

one glass gob in said blank mold into a glass blank, a final mold having at least one cavity for receipt of at least one glass blank, another forming device to form said at least one glass blank in said final mold into an article of glassware, an invert base driven for oscillation about an axis between first and second positions by a first actuator, and first and second arms carried by the invert base for oscillation with the invert base so that the first and second arms are moved to transfer glass blanks from the blank mold to the final mold, said glassware forming machine including:

a ball screw positioned within said invert base coaxially with said axis about which the invert base is oscillated, said ball screw having spaced oppositely threaded portions,

first and second nuts each threadably engaging a separate one of said oppositely threaded portions of said ball screw for reciprocation toward and away from each other along said ball screw upon rotation of said ball screw, each of said first and second nuts being operably associated with a separate one of the first and second arms to reciprocate the first and second arms toward and away from each other along said axis with said first and second nuts, and

an actuator operably associated with said ball screw to rotate said ball screw in opposed directions and move said nuts and said neck ring arms toward and away from each other along said axis.

79. (New)

The glassware forming machine of claim 78 wherein said actuator includes a reversible electric motor.

80. (New)

A method of forming articles of glassware with an apparatus having a blank mold, a final mold, an invert base driven for oscillation about an axis between first and second positions, a ball screw positioned for rotation within said invert base coaxially with said axis and having spaced oppositely threaded portions, first and second nuts each threadably engaging a separate one of said oppositely threaded portions of said ball screw for reciprocation toward and away from each other along said ball screw upon rotation of said ball screw, and first and second neck ring arms each carried by the invert base and coupled to a separate one of the first and second nuts for reciprocation of the first and second neck ring arms toward and away from each other along said axis with said first and second nuts, said method including the steps of:

positioning said invert base in its first position wherein the first and second neck ring arms are disposed adjacent to the blank mold;

providing at least one glass gob into the blank mold;

forming said at least one glass gob in said blank mold into at least one glass blank that is carried by the first and second neck ring arms;

moving the invert base about said axis from its first position to its second

position thereby moving the first and second neck ring arms to a position adjacent to the final mold and positioning the glass blanks carried by the first and second neck ring arms in the final mold;

rotating the ballscrew in one direction to move said first and second neck ring arms away from each other along the invert base to release the glass blanks from the first and second neck ring arms; and

forming said glass blanks in said final mold into articles of glassware.

81. (New)

The method of claim 80 which also includes the step of returning the invert base to its first position in preparation for a subsequent cycle.

82. (New)

The method of claim 80 which also includes the step of rotating the ball screw in a direction opposite said one direction to move the first and second nuts toward each other, and thereby move the first and second neck ring arms toward each other in preparation for a subsequent cycle.